

Experience with the Review of the Safety Analysis Reports

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Content

- process of NPP licensing, role of the ÚJD SR, legislation, procedures and documentation requested
- Safety Analysis Report – purpose, format, structure and content
- review of the SAR – focused on chapter 15 (safety analysis), description of the review process
- revision process – initial, main, final phase
- content and format of the revision report
- major findings, statistics, internal surveillance



NPP licensing process (in regard to Safety Analysis Report)

- operator's request to operate the nuclear facility
- permission issued by ÚJD SR based on the operator's request documented by (Act 130/98, §15, 2):
 - 4 technical documents for approval (technical specifications, operating program, QA program and internal emergency operating procedures)
 - 11 technical documents for review (among others Preoperational Safety Report)
- periodical reassessment - during the plant operation the safety of the installation is evaluated on the regular basis - intervals and scope are defined by ÚJD SR (Act 130/98, §20, 6)
- ÚJD SR evaluates the nuclear safety of the nuclear installations independently from the operator (Act 130/98, §32, 2f)



Safety Analysis Report

- prepared by the operator and submitted to ÚJD SR for review
- most comprehensive information about the nuclear installation describing its behavior during all possible phases (the start-up phase, normal operation, abnormal operation, emergency conditions, refueling, etc.)
- content and format – in general according the US NRC RG 1.70, ÚJD SR guides and other international documents
- specific requirements for particular SAR defined in ÚJD SR decisions – content, time schedule, additional information
- independent review by ÚJD SR in cooperation with external organizations (domestic and/or international, research institutes, universities, private companies)



Chapter 15 of SAR and its review

- dealing with safety analysis
- content defined by the ÚJD SR guide BNS I.11.1/1995, latest edition from 1999 (only for transients and accidents considered in the reactor design):
 - list of initiating events and their categorization
 - acceptance criteria
 - assumptions for accident analysis (initial conditions, availability and functioning of systems and components, operator actions, modeling assumptions)
 - quality assurance
- revision done by the Department of the Safety Analysis and Technical Support
- neutron kinetics, thermal hydraulic response of the primary and secondary circuit and containment (other parts done by external organizations – structural analysis, radiological analysis, PTS)



- focused on the completeness of the document, fulfillment of the acceptance criteria, use of the appropriate methodology, data correctness
- time available for the revision – 2 months



Revision process

- Initial phase
- Main phase
- Final phase

Initial phase

- receipt of the documentation
- formal revision for completeness and correctness
- definition of the working groups and responsibility, distribution, definition of the schedule, intermediate progress meetings, deadline time
- definition of the output (report, format of the report ...)
- contracts for the external cooperation



Main phase

- collection of the information and documents necessary for the revision (technical documentation, blueprints, database, previous reports, independent analysis, site inspection ...)
- first revision of the SAR – general, focused on completeness, content, acceptance criteria taken into account, list of initiating events, sources ..., partition among the working group members
- draft of the revision report
- second revision of the SAR – in depth, independent comparison of technical parameters, codes, nodalization schemes, initial and boundary conditions, steady state parameters, kinetic parameters, material characteristics, safety systems, single failure criterion, operator actions, mathematical models, results
- independent comparison of the calculated results – to the previous calculations (SARs, database, ÚJD SR and/or other organizations' calculations ...)



- independent calculations – selection based on following criteria:
 - availability (codes and input deck we have)
 - most penalizing cases (ideal for every group of initiating events)
 - controversial calculations (disputable assumptions, disputable or unrealistic calculation results, ...)
 - codes: RELAP5, MELCOR, (ATHLET)



Final phase

- report work-out
- comparison of calculations (described in SAR and independent calculations of ÚJD SR)
- internal annotation (within ÚJD SR technical departments)
- finalization and incorporation to the ÚJD SR statement
- shortcomings highlighted, summary of the requested information to be complete, controversial parts to be explain, missing information to be add
- approval/disapproval



Content and format of the revision report

- obligatory parts – introduction, objectives and scope of the report
- review of the methodology used in SAR
 - list of initiating events and their categorization
 - acceptance criteria
 - analysis assumptions (initial conditions, availability and functioning of systems and components, single failure criterion, operator actions, modeling assumptions, quality assurance)
- detailed review of each group of the initiating events (except radiological analysis, PTS and Structural analysis)
- conclusions
- Appendix (list of major findings and questions submitted to the utility, independent calculations)



Typical findings

- categorization (frequency calculations)
- acceptance criteria (not taken into account, insufficient/uncertain interpretation)
- classification of the safety vs. control systems
- application of the single failure criterion
- operator actions (inappropriate use, not defined)
- missing, wrong data, deficient description
- degree of the conservatism
- inappropriate use of the computer code or nodalization scheme



Statistics

- Chapter 15 represents in average over 1,000 pages (last one had 1,346 pages)
- 3-4 members of the department involved in revision
- approximately 2 months of work ~ 1,000 man-hours

Internal surveillance

- during the first years of the existence of the department within the SWISSLOVAK project (Swiss inspectorate, ERI) – revision of POSAR for Mochovce NPP
- internal annotation within the ÚJD SR technical departments
- revisions done: POSAR for Mochovce NPP, ATWS Accidents included in SAR for V2 Bohunice NPP, SAR for V1 Bohunice NPP after the gradual reconstruction
- existence of the department has a positive feedback on the SAR quality